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First report of gynandromorphism in *Xylocopa aeneipennis* (De Geer) (Hymenoptera: Apidae)

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Introduction

Gynandromorphism is a teratological condition in which an individual displays both male and female phenotypic traits. Among Hymenoptera, accumulated knowledge of bees (Anthophila) and observations of gynanders provide valuable insights into how these phenomena occur (Wcislo et al. 2004; Michez et al. 2009). Within the Apidae, several cases were documented (Wcislo et al. 2004; Michez et al. 2009), with many observations coming from the genus *Xylocopa* (Maidl, 1912; Enderlein, 1913a, 1913b; Carcasson, 1965; Gordh & Gulmahamad, 1975; Lucia et al., 2009, 2012, 2015; Zama & Coelho, 2017; Almeida et al., 2018; Villamizar, 2020; Almada et al., 2022). This extensive dataset for a single genus provides solid points of comparison for understanding the mechanics of gynander formation.

Results and Discussion

A *Xylocopa aeneipennis* (De Geer, 1773) *sensu* Mawdsley (2018) gynander specimen collected in Raleigh Falls (Suriname) in 1990, was found in the entomological collection of the Naturalis Biodiversity Center, Netherlands. This specimen is placed within the subgenus *Neoxylocopa* based on its ventral carina strongly developed and the dorsolateral margin of clypeus strongly raised above adjacent paraocular area (Fig. 1c). This specimen represents the first documented case of gynandromorphism in *X. aeneipennis*. It falls into the category of mosaic gynandromorphs, characterized by the random distribution of male and female traits across the body (Michez et al. 2009). Most of the body exhibits a female phenotype, except for the right half of metasomal tergum 1 and a small portion of the right side of the propodeum, which display male characteristics (Fig. 1a,b,c,d). The female phenotype is identifiable by the black cuticle and body hair, whereas the male phenotype is distinguished by the orange-colored cuticle and the highly plumose, orange body hair, features commonly observed in many male *Xylocopa* (Fig. 1e,f).

Compared to other *Xylocopa* gynanders, this specimen exhibits reduced phenotypic abnormalities, suggesting that gynandromorphism may be triggered at different embryological stages. Under the assumption that earlier developmental anomalies lead to more pronounced gynandromorphism, this case may represent a later-stage occurrence. The frequent detection of these anomalies in the *Xylocopa* genus is likely due to the relatively large body size for a bee (i.e. they are very visible in an entomological collection and in the field) and probably the strong sexual dimorphism (i.e. black color for female versus yellow for male in many species). The accumulation of data within a single genus provides numerous reference points for comparative analyses, contributing to a better understanding of teratological mechanisms. Rather than the significance of any single specimen, it is the growing catalog of documented cases that will serve as a foundation for future studies on the underlying mechanisms of this phenomenon (Brau et al., 2024).

Material

https://data.canadensys.net/micropublications/resource?r=specimen_42

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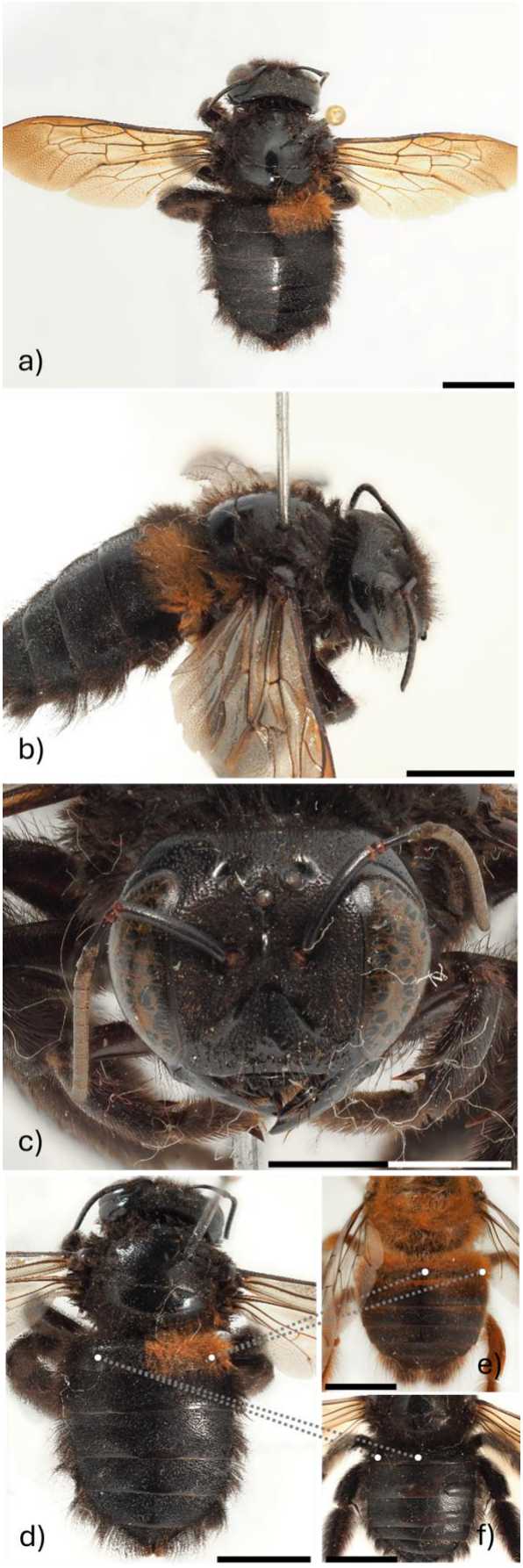

Fig. 1. Studied *Xylocopa aeneipennis* gynander, RMNH.INS.1713996. **a)** Habitus in dorsal view. **b)** Habitus in lateral view. **c)** Head in frontal view. **d-f** Phenotypic comparison of metasoma **d)** Metasoma of *Xylocopa aeneipennis* gynander. **e)** Metasoma of *Xylocopa aeneipennis* male. **f)** Metasoma of *Xylocopa aeneipennis* female. All scale bars are equal to 0.5cm. Photo by Thomas Wood, used with permission.